Journal of the Royal Society of Western Australia, 80:231-233, 1997

The ant communities of Sanford Rock Nature Reserve, Westonia, Western Australia

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Abstract

This study investigated the ant communities present in the Sanford Rock Nature Reserve (325 mm mean annual rainfall, 300 km East of Perth), an 800 ha Reserve comprising a complex mosaic of granite outcrop and tumbled boulders with surrounding flat areas carrying woodlands or shrublands. Nine locations in the reserve and two others in a eucalypt woodland 9 km away were sampled with pitfall traps and hand collection during March of 1994–1996. A total of 87 ant species from 22 genera was recorded. Three genera, *Iridomyrmex* (22 species), *Camponotus* (12 species) and *Melophorus* (11 species) represented 51.7% of the total species composition, which is typical of ant communities in arid and semi-arid Australia. Ant species richness (>30) was greatest in *Eucalyptus* woodlands with mixed shrub understorey species. The *Callitris* and *Acacia* low shrub thicket were represented by 18 and 21 species respectively. Thickets with *Allocasuarina* or *Eucalyptus crucis* had the lowest species richness (< 15). These thickets were in deep soil pockets which were moist and contained large amounts of litter. Hot climate specialist ants were poorly represented in the species poor areas.

Introduction

Westonia is a small agricultural and gold mining district 285 km east-north-east of Perth, Western Australia (31° 40' S, 118° 35' E). The district has been extensively cleared for wheat growing and sheep grazing and the nearest piece of remnant vegetation is 9 km north-east of the town at the Sanford Rocks Nature Reserve (800 ha). The reserve is in very good condition as it has been fenced off from cattle and sheep grazing and there have been no fires in nearly all of the reserve since at least 1927 (Muir 1979). This area experiences a Mediterranean climate typical of the wheatbelt regions. Summer thunderstorms occur occasionally but most of the rainfall occurs during winter. The average annual rainfall is 325 mm.

The role of fauna within mature and developing ecosystems situated on previously disturbed land is often neglected. There is a paucity of long-term studies on fauna recolonization (Majer 1989). Ants are one of the most important invertebrate groups in Australia especially in seasonally arid regions (*e.g.* Westonia). They are useful as bio-indicators of change in the environment (Andersen 1990; Majer 1983). Ant community structure is influenced by interaction with their habitat, mainly with the vegetation complex (Andersen 1986).

The aim of this study is to assess the ant communities present on several of the vegetation communities and to determine the factors influencing the patterns of their community organisation.

Granite Outcrops Symposium, 1996

Methods

Site selection

Ants were sampled annually from 1994–1996 on eleven transects. Nine sites were sampled in the reserve. These were; (Eg) grass-eucalypt woodland boundary *Eucalyptus capillosa* woodland with sparse herb understorey of *Amphiphogon strictus;* (Sg) salmon gum woodland with *E. salmonophloia, E. sheathiana* and *E. myriadena* with an *Acacia* and chenopod understorey; (Th) *Acacia* scrub thicket on rock edge; (Gw) *E. salubris* and salmon gum, *E. salmonophloia* woodland with a sparse chenopod understorey; (Al) *Allocasuarina huegeliana* thicket; (Yg) *E. loxophleba, E. myriadena* and *E. salmonophloia* woodland with a sparse understorey of *Acacia, Melaleuca, Borya* sp; (Cx) *E. crucis* thicket with dense understorey of *Kunzea* and *Calothamnus;* (Ov) overhang with mixed *Acacia* and Myrtaceae shrubs; and (Ct) *Callitris columeliaris* thicket.

Two other locations were sampled 9 km away from the reserve. The disturbed site (Ewd) is situated at the eastern end of the Westonia town-site where the hospital was situated 70 years ago. It is a *Eucalyptus* woodland of 15–20 m in height. The upper canopy is dominated by *E. longicornis* and *E. salubris* with a sparse understorey of *Acacia hemiteles* and chenopod shrubs. The undisturbed woodland (Ewu) is situated at the town commons. The vegetation is a *Eucalyptus* woodland dominated by *E. salubris* and the understorey is a dense association of *Acacia* and *Melaleuca* species.

Sampling methods

Ants were sampled using pitfall traps (1.8 cm diameter Pyrex®) which were partly filled with a 30:70 glycerol : alcohol mixture). Each location was sampled with a transect of ten traps with 10 m spacing and operated for a 1 week period during mid-March. Hand collections

Table 1

The number of ant species collected in the study at Sanford Rock Nature Reserve.

Area[1]	Sanford Rock Nature Reserve									Non reserve	
	Thickets					Eucalypt woodland					
	Cx	Ov	Al	Th	Ct	Eg	Gw	Yg	Sg	Ewu	Ewd
Myrmeciinae											
Myrmecia									1	1	1
Ponerinae											
Bothroponera						1	1		1		
Rhytidoponera	2		1	1	3	3	3	2	3	3	4
Odontomachus					1		1		1	1	
Myrmicinae											
Crematogaster							1		1		
Aphaenogaster					1				1		1
Cardiocondyla										1	
Monomorium	1	2	5	4	2	6	1	7	6	4	6
Meranoplus					1			1	2	2	1
Pheidole		2	1	2						1	2
Tetramorium			3	1			1	2		1	3
Podomyrma				1				1			
Pseudomyrmecinae											
Tetraponera						1			1		1
Dolichoderinae											
Iridomyrmex	4	5	1	2	5	6	10	6	9	12	8
Papyrius									1	1	
Formicinae											
Calomyrmex					1	1	1		1	1	1
Camponotus	2	1		2	4	5	5	7	8	6	7
Melophorus		1	2	5	3	7	7	5	8	3	7
Notoncus											1
Ophistopsis								1			
Polyrachis						1	1	1	1	1	
Stigmacros										1	
TOTAL SPECIES	9	11	13	18	21	31	32	33	45	39	43

[1] ants listed by subfamily (bold) and genus (italic).

were also performed for uniform periods during the day. Ants were sorted to genera and a number or letter code was allocated to each specimen which applies only to this study. The vegetation composition, cover, density, percent leaf litter cover and percent bare ground were measured at equidistant intervals along each transect.

Results and Discussion

A total of 87 ant species from 22 genera was recorded (Table 1). Three genera, *Iridomyrmex* (22 species), *Camponotus* (12 species) and *Melophorus* (11 species) represented 51.7% of the total species composition which is typical of ant communities in arid and semi-arid Australia (Greenslade 1976; Andersen 1983). Classification of ants into functional groups (Andersen 1990; Greenslade 1979) shows that dominant ant species (*Iridomyrmex*) contributed 20–30% to the diversity of the communities with high species richness (Fig 1). Dominant species also contributed > 60% of the total catch where they were present in high frequencies.

Ant species richness (>30) was greatest in *Eucalyptus* woodlands with mixed shrub understorey species. The *Acacia* low shrub and *Callitris* thicket were represented by 18 and 21 species respectively. Thickets with *Allocasuarina* or *Eucalyptus crucis* had the lowest species

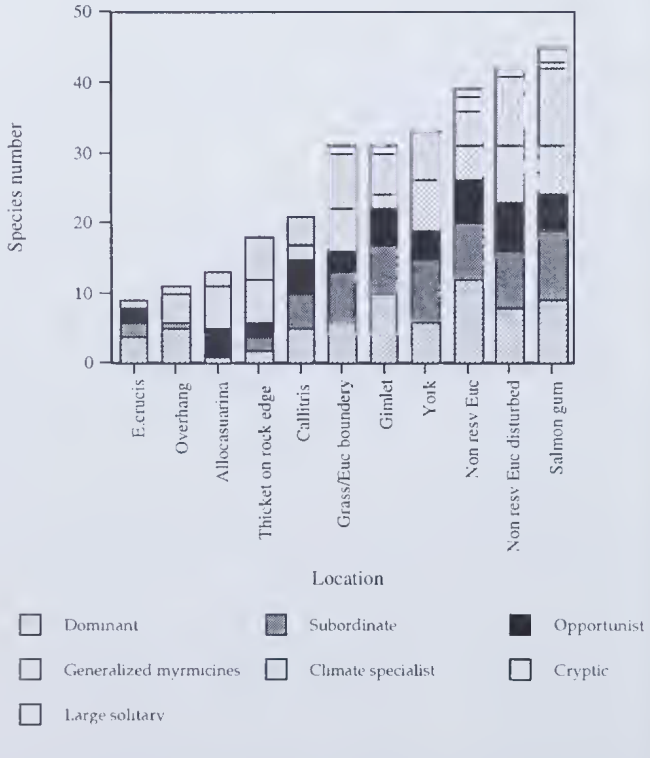

Figure 1. Classification of ant communities present in the 11 sites by functional groups.

richness (< 15). These thickets were in deep soil pockets which were moist and contained large amounts of litter. Hot climate specialist ants *e.g. Melophorus* and *Meranoplus* species were poorly represented in the species-poor areas.

Ordination of the presence and absence data of ants in each transect was performed, and axes 1, 2 and 3 represented 24.6, 14.8 and 13.1% of the total variance, respectively.

Three main groupings could be identified from the ant assemblages;

- sites with eucalypt woodlands but with two identifiable subgroups of the reserve and non-reserve areas; *Callitris* thicket appeared to be similar to these sites;
- the *Acacia* scrub and *Allocasuarina* thickets were similar; and
- the *E. crucis* and overhang area were similar.

Factors which appeared to be important to ant species richness were tested. A negative correlation was observed between the number of ant species and percentage litter cover ($r = -0.559$) and vegetation cover ($r = -0.542$). Many factors such as soil moisture, depth of litter, density of ground vegetation and soil type determine the availability and suitability of nest sites and foraging behavior. These factors consequently affect the diversity of ants in an area (Greenslade 1979).

Acknowledgments: We thank the students involved in the Terrestrial Ecology 301 field trips who participated in various aspects of the study.

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